

REMARKS

The following remarks are provided in response to the Office Action ("office action") mailed March 6, 2009 in which the office action:

- rejected claims 1, 3-4, 6-8, 12, 14-15, 17, 24, 26-27, 31, 38-39 and 41-42 under 35 U.S.C. §103(a) as being unpatentable over WO99/043023 - US 6,372,581 to Bensahel et al. (hereinafter Bensahel).
- rejected claims 10, 11, 29, 30 and 32 under 35 U.S.C. §103(a) as being unpatentable over Bensahel in view of US Pub. 2002/0179884 to Niimi et al. (hereinafter Niimi).
- rejected claims 18 and 20-22 under 35 U.S.C. §103(a) as being unpatentable over Bensahel in view of US Pub. 2002-0119674 to Thakur (hereinafter Thakur).

The Applicants respectfully request reconsideration of the above referenced patent application for the following reasons:

Claims 1, 3-4, 6-8, 12, 14-15, 17, 24, 26-27, 31, 38-39 and 41-42 rejection under 35 U.S.C. §103(a)

Claims 1, 3-4, 6-8, 12, 14-15, 17, 24, 26-27, 31, 38-39 and 41-42 are rejected under 35 U.S.C. §103(a) as being unpatentable over Bensahel.

Independent claim 1, from which claims 3-4 and 6-7 depend, includes the feature, *"incorporating nitrogen into a dielectric film using ammonia (NH₃) gas in a rapid thermal annealing process, wherein an ultra-low pressure equal to or less than about 10 Torr is used for the rapid thermal annealing process at a temperature between about*

900-1100°C.” Independent claims 8, 12 (from which claims 14-15 and 17 depend), 24 (from which claims 26-27 and 31 depend) and 38 (from which claims 39 and 41-42 depend) each include a similar feature.

The Applicants respectfully request reconsideration of claims 1, 3-4, 6-8, 12, 14-15, 17, 24, 26-27, 31, 38-39 and 41-42 in view of at least the following arguments: 1) the reference teachings fail to establish a *prima facie* case of obviousness, 2) the proposed modification of Bensahel with “*a temperature between about 900-1100°C*” improperly changes the principle of operation of Bensahel, and 3) the proposed modification of Bensahel with “*a temperature between about 900-1100°C*” would render Bensahel unsatisfactory for its intended purpose.

1) The reference teachings fail to establish a *prima facie* case of obviousness

The reference teachings need to establish a *prima facie* case of obviousness. The office action states, “*the RTP process described in Bensahel et al. uses the claimed temperatures (column 1 lines 35-55).*” (See office action, p. 2, second paragraph.) However, in this section of Bensahel, only a temperature range of 850 – 900°C is disclosed. (See Bensahel, e.g., col. 1 lines 35-55.) By contrast, as described above, the Applicants teach and claim “*a temperature between about 900-1100°C.*” The temperatures of Bensahel, which fall in the range of 850 – 900°C, are not in the range between about 900-1100°C, as taught and claimed by the Applicants. As such, the range disclosed in Bensahel does not overlap with the range taught and claimed by the Applicants.

Accordingly, the reference teachings fail to establish a *prima facie* case of obviousness.

2) The proposed modification of Bensahel with “a temperature between about 900-1100°C” improperly changes the principle of operation of Bensahel

Bensahel fails to disclose a process of rapid thermal annealing at “a temperature between about 900-1100°C.” Instead, the office action asserts that “one of ordinary skill in the art would recognize that Bensahel can be modified to this temperature.” (See office action, p. 5, first paragraph.) However, citing *In Re Ratti*, the M.P.E.P. states,

“[i]f the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious.” (See M.P.E.P. 2143.01 § VI.) (Emphasis added.)

The proposed modification of Bensahel with “a temperature between about 900-1100°C” improperly changes the principle of operation of Bensahel.

Specifically, Bensahel discloses annealing a silicon oxide layer with nitric oxide “at a temperature at most equal to 700°C,” which is outside of the claimed range. (See Bensahel, e.g., col. 1, lines 58-62. Emphasis added.) Furthermore, Bensahel discloses that annealing at high temperatures such as 850-900°C is undesirable because it does not allow the presence of nitrogen to be localized precisely at the interface between a substrate and a gate oxide layer. (See Bensahel, e.g., col. 1, lines 41-45.) That is, at temperatures that exceed 850°C, the process of Bensahel fails to precisely localize nitrogen at the interface of the substrate and the gate oxide layer. However, localization of nitrogen at the interface of the substrate and the gate oxide layer is a primary purpose

for the process disclosed in Bensahel. On the other hand, the office action asserts that *“Bensahel can be modified to this [900-1100°C] temperature depending on the amount of nitrogen desired at the interface between the substrate and the gate oxide layer.”* (See office action, p. 5, first paragraph.) However, to the contrary, ***Bensahel requires that the anneal temperature not exceed 850°C*** in the process of Bensahel because it would not allow the presence of nitrogen to be localized precisely at the interface between a substrate and a gate oxide layer, changing the principle of operation of Bensahel. As such, **the proposed modification of Bensahel with “a temperature between about 900-1100°C” improperly changes the principle of operation of Bensahel.**

3) The proposed modification of Bensahel with “a temperature between about 900-1100°C” would render Bensahel unsatisfactory for its intended purpose

The Applicants also direct the Examiner to M.P.E.P. 2143.01 § V, which states in part,

“V.THE PROPOSED MODIFICATION CANNOT RENDER THE PRIOR ART UNSATISFACTORY FOR ITS INTENDED PURPOSE. If proposed modification would render the prior art invention being modified **unsatisfactory for its intended purpose**, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).” (Emphasis added.)

For at least the reasons described above, under section 2 of this argument, **the proposed modification of Bensahel with “a temperature between about 900-1100°C” would render Bensahel unsatisfactory for its intended purpose** because it would not allow the presence of nitrogen to be localized precisely at the interface between a substrate and a gate oxide layer.

Accordingly, for at least the above reasons, the Applicants respectfully request the Examiner to remove the rejection of claims 1, 3-4, 6-8, 12, 14-15, 17, 24, 26-27, 31, 38-39 and 41-42.

Claims 10, 11, 29, 30 and 32 rejection under 35 U.S.C. §103(a)

Claims 10, 11, 29, 30 and 32 are rejected under 35 U.S.C. §103(a) as being unpatentable over Bensahel in view of Niimi.

Claims 10 and 11 depend from independent claim 8. Claims 29, 30 and 32 depend from independent claim 24. The Applicants respectfully request reconsideration of claims 10, 11, 29, 30 and 32 in view of the above arguments regarding independent claims 8 and 24.

Claims 18 and 20-22 rejection under 35 U.S.C. §103(a)

Claims 18 and 20-22 are rejected under 35 U.S.C. §103(a) as being unpatentable over Bensahel in view of Thakur.

Independent claim 18 includes features similar to the features of independent claim 1, described above. The office action relies on Thakur merely to disclose “*clustering various steps in a similar process.*” (See office action, p. 7, fifth paragraph.) Accordingly, the Applicants respectfully request reconsideration of claims 18 and 20-22 in view of the above arguments regarding independent claim 1.

CONCLUSION

The Applicants submit that they have overcome the office action's rejections of the claims and that they have the right to claim the invention as set forth in the listed claims. The Examiner is respectfully requested to contact the undersigned by telephone if it is believed that such contact would further the examination of the present application.

Pursuant to 37 C.F.R. 1.136(a)(3), the Applicant(s) hereby request and authorize the U.S. Patent and Trademark Office to (1) treat any concurrent or future reply that requires a petition for extension of time as incorporating a petition for extension of time for the appropriate length of time and (2) charge all required fees, including extension of time fees and fees under 37 C.F.R. 1.16 and 1.17, to Deposit Account No. 02-2666.

Respectfully submitted,

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